ArcGIS
Lab 3: Overlay Analysis

QUICK OVERVIEW:

1. **Issue**: determine the area and value of the land contained in the buffer zones previously generated

2. **Learning Objectives**: to gain proficiency conducting overlay analyses and calculations within the database table

3. **Data**: you will be utilizing the same data set as last lab.

4. **Analysis**:
    a. Consolidate (append) the buffers into one data layer
    b. Overlay this layer onto the forest layer to determine area and value of the forest within the buffer reserve zones

5. **Interpret Results**: be sure you understand all new map data that you create

6. **Communicate Results**: make a map layout that clearly communicates your results.

THE ISSUE

As previously outlined, this lab continues on from where the previous buffer lab ended. First you will create a map layer that contains bear dens plus a layer that buffers these dens. Then you need to create a map layer that consolidates all of the previous buffer zones as these areas will be either reserved from harvest or will have special restrictions.

After the buffers are consolidated (appended) into one map layer, this new layer will be overlaid on top of the VIU Forest layer as we are interested in the value of the land within these reserve zones.

LEARNING OBJECTIVES

You will further develop the following ArcGIS skill sets:

- Create/edit attribute tables
- Create a map layer from X,Y coordinates
- Create buffers
- Utilize various ToolBox functions (Append, Dissolve, Clip)
- Determine area of polygons within a data layer
- Calculate values within a database table
- Create a map layout.

DATA

You already have the data from the last lab. There is no new data to copy from the G: drive. However, you do have to create a bear den map layer.

Create a Point Layer from Coordinates

The locations of four bear dens were determined using GPS. Create a *dBase Table* called **BearDens.dbf** that has the following fields:

- DenID
- Easting
- Northing
- TreeCode
- HTm
- DIAcm

Remember:

- Text – for a mix of characters (letters and/or numbers)
- Short integer – up to 4 digits (**NO** need to define precision)
- Long Integer – up to 9 digits (**NO** need to define precision)
- Float – real number; up to 7 digits
  - precision = # of digits
  - scale = # of decimal places
  - e.g. prec=5, scale=2 can store 123.45
  - e.g. prec.=7, scale=3 can store 1234.567
- Double – real numbers; for 8+ digits
  - Precision and scale as before

- Tree Codes
  - Bg – grand fir
  - Cw –western redcedar
  - Dr – red alder
  - Fd – Douglas-fir
  - Hw – western hemlock
  - Mb – big leaf maple
  - Pl – lodgepole pine
  - Pw – white pine

- Enter data:
  - Enter the values into the table above. Locate the bear dens within 2 different stands that have trees greater than 36 metres tall and have at least some Cw-western redcedar (>=5%). You are responsible to 'generate' unique data for this table.

- Create a map layer showing these point locations.
- Symbolize the points with an appropriate symbol

Save your map document.

ANALYSIS & INTERPRETATION (you should interpret all new data layers as you create them)
** When conducting analysis new layers will be created ** Be sure to save the new layers with names provided ** Failure to do so will result in loss of marks ***

- Create a 80-metre buffer around the bear dens – call the new layer **DenBuffer**

Save your map document.

Consolidate the buffers into one map layer
Thus far we have created buffer layers around four types of features: nests, streams, trails and bear dens. Future analyses will be much simplified if we consolidate these four layers into one. One option for consolidating these layers is to use the **Append** tool.

- First you will need to create a new, empty polygon shapefile – call it **Reserves.shp**, set the coordinate system to match your existing data frame, then add it to your map document.

- In ArcToolBox, expand Data Management Tools and then General, and double-click Append
    - Using the top drop-down box, select each of the four buffer layers you wish to consolidate
    - For the *Target Dataset* select Reserves
    - For *Schema Type* select NO_TEST
    - Click OK

You now have a new map layer that contains all the buffer zones. Take a look at this new layer. What fields are there in the table? Select a few of the records in the table and take note of the associated polygons. What happened to the areas where the buffers overlapped (i.e. where the trail buffer overlapped the stream buffer)?

Save your map document.

Dissolve internal boundaries within the VIU Forest
The VIU Forest layer currently is comprised of several adjacent polygons. These polygons have different legal status. However, from our perspective, all we need is a single polygon to delineate the boundary of forests managed by VIU. Dissolving the internal boundaries is necessary. We will use the Dissolve function to accomplish this task. This function compares adjacent polygons and dissolves the boundary if the value for a specified field is equal.

- Open the table for VIU Forest and determine if there is a field that has the same value for each polygon. If there is then you can use this field in the next step. If there is no field with common values then you will have to create such a field.

- In ArcToolBox expand Data Management Tools, then Generalization, then double-click Dissolve
    - Using the Input Feature drop-down box select VIU Forest
    - For the Output Feature Class be sure the layer will be created in your working directory and call the new layer **VIU_Outline.shp**
    - Click OK
    - Change the symbology so that the new layer has no colour and is hollow
    - Look in the data table – how many records are there?

Save your map document.

Clip the Reserves and VIU boundary together
Next we will combine the VIU Outline and the Reserves layers so that only the reserves contained within the VIU forest are recognized.

- From the ArcToolBox expand Analysis Tools, then Extract, double-click Clip.
    - Consider the helpful diagram and then select the appropriate layers for the Input and Clip layers
    - For the Output Feature Class be sure the layer will be created in your working directory and call the new layer **VIU_Reserves.shp**
    - Click OK
    - How does the new layer differ from the original Reserves layer? Note: if your output layer contains no polygons, then remove it from the TOC, click the Clear Selected Features button and then try clipping again.

Save your map document.

Determine the land area and value within the reserves
Next we need to calculate the areas of each of the polygons within the VIU_Reserves data layer.

- Open the data table for VIU_Reserves.
    - Add a field called AREAm (it should be real number that can have up to 9 digits with 1 decimal place)
        - Right-click on AREAm and select Calculate Geometry, click Yes, Property should be Area and Units should be Square Metres, click OK
    - Add a field called AREAha (it should be real number that can have up to 9 digits with 2 decimal places)
        - Right-click on AREAha and select Field Calculator, click Yes, double-click AREAm, then click /, then type **10000**, click OK
    - Add a field called Value (long integer with a Precision of 9)
        - Use the field calculator and multiply the AREAha by 55,000 (i.e. $55,000 per ha) to derive the land value

Save your map document.
